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SERIAL No. 23440-8-9059/01-SQ

CANMET

DEEP CLEANING PILOT PLANT

FINAL REPORT

BY:

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FINAL REPORT

1.0 INTRODUCTION

Associated Mining Consultants Ltd. (AMCL), with Bradon Industries Ltd. as sub-contractors, were awarded a contract by Department of Supply and Services (D.S.S.) to review the available design, install equipment and commission Phase I and parts of Phase II of the deep cleaning section for the 10 t/h pilot plant located at the Coal Research Laboratories, Devon, Alberta.

The full statement of work can be found in Appendix A.

1.1 BACKGROUND

The 2 t/h deep cleaning section of the pilot plant was designed to produce a feed for the preparation of coal water mixtures or pelletized coal. The new section will either accept the product of the existing pilot plant or be fed directly with a test coal. The coal will be upgraded by grinding and deep cleaning using froth flotation cells. Different deep cleaning processes will be installed in the future.

Sections of the initial design report (D.S.S Contract Serial Number 0SQ85-00188) together with flowsheets and layout drawings were distributed to prospective bidders as part of the request for proposal (SSC file No. 007SQ-23440-8-9059/5).

2.0 WORK UNDERTAKEN

The work carried out under the basic contract is as stated in the scope of work (Appendix A). This original scope of work was expanded to include the design, procurement, fabrication and erection of the high intensity mixing and slurry conditioning system.

The decision to design a mixing/conditioning system was based upon the experience of the coal water fuel plant in Sydney, Nova Scotia. They have found that the chemical reagents require a high intensity mixer to adequately disperse the slurry mixture and this mixture then requires a long period of conditioning to release entrapped air, lowering the viscosity and allowing the coal water mixture to be used as a coal water fuel.

Extensive changes to the structural steel were required when installing equipment, to give additional support. The main reason being that the steel was designed for different equipment to that actually purchased. The location of some equipment was changed slightly to give better access within the plant and some pipe runs were changed to give a better tie-in to the existing pilot plant system.

General arrangement and piping layout drawings of the as-built plant were prepared using Autocad. When future additions are made to the pilot plant these autocad drawing files can be updated to include the new equipment. This will be quicker and more economical than redrawing new as-built drawings.

3.0 PROCESS DESCRIPTION

The following process description relates only to the portion of plant installed by AMCL under D.S.S. contract Number 23440-8-9059/01-SQ.

The 10mm x 0 feed to the deep cleaning pilot plant is obtained from the existing pilot plant; the overflow from the clean coal drain and rinse screen, the flotation clean coal and water only cyclone clean coal.

The clean coal drain and rinse screen overflow goes to a crusher via a chute and vibrating feeder. The crusher underflow and the flotation and water only cyclone clean coal flows into the Ball Mill Feed Sump where dilution water is added. The fine coal slurry from this sump is pumped into the existing Ball Mill where the coal is further reduced in size. The slurry discharged from the Ball Mill is collected in the discharge sump. The level of slurry in this Ball Mill Discharge Sump is controlled using a capacitance level probe and controller which controls the addition of dilution water, maintaining the level at a pre-set level.

The slurry from the Ball Mill Discharge Sump is pumped up to the classifying cyclones which classify the fine coal according to size. The coarser particles from the cyclone underflow are recirculated back to the Ball Mill and the correctly sized, finer particles proceed into the system.

The cyclone overflow first goes to a wet drum magnetic separator which removes any magnetic particles and then flows to the dewatering cyclones. Excess water, removed by the dewatering cyclones, flows out to the existing thickener. The thickened cyclone underflow flows down to the flotation cell feed sump. The coal slurry from this sump will be pumped up

to the future flotation cell system which will deep clean the finely ground coal. Two stages of froth flotation are proposed with a thickening system between Stage 1 and Stage 2 using thickening cyclones.

The final clean coal product will flow to the filter feed sump and will then be pumped to the future drum filter to remove excess water in preparation for making a coal water fuel. The drum filter will have a steam jacket to assist in dewatering the filter cake.

The filter cake will gravitate via a chute to the mixing/conditioning system which intimately mixes chemical reagents with the coal water mixture using a high intensity mixer and allows the coal water mixture to condition and release entrapped air.

After a suitable conditioning time the coal water fuel can be outloaded into barrels.

4.0 EQUIPMENT DESCRIPTION

ITEM	MODEL	SUPPLIER	PURCHASER
Crusher	12x8 W	MinPro	Canmet
Vibrating Feeder	M40A	Eriez	AMCL
Ball Mill Feed Pump	SPVC 232-2	Sala	Canmet
Ball Mill Discharge Pump	SPV 263-3	Sala	Canmet
Sieve Bend	PR-B-2-45	Dorr Oliver Long	Canmet
Clasifying Cyclones		Mozley	Canmet
Magnetic Separator	3036	Eriez	Canmet
Dewatering Cyclone Feed Pump	SPVC 263-3	Sala	Canmet
Dewatering Cyclones	C109	Mozley	Canmet
Filter Feed Pump	SPVC 263-3	Sala	Canmet
Froth Flotation Feed Pump	SPVC 232-2	Sala	Canmet

ITEM	MODEL	SUPPLIER	PURCHASER
Thickening Cyclone Feed Pump	SPVC 304-4	Sala	Canmet
Thickening Cyclones	C109	Mozley	Canmet
Fluidizing Mixer	PVTVR-20-240 89B009-01A	Prochem	AMCL
Fluidizing Pump	Tuthill 3A	Hydrodynamics	AMCL
Conditioning Mixer	PVTO-3-168 89B009-02A	Prochem	AMCL
Conditioning Pump	Tuthill 3A	Hydrodynamics	AMCL
Reagent Mixers	Patterson ¼ HP	Novatech	AMCL
Reagent Pumps	Prominent B02035N	Keller	AMCL
Level Indicators	Endress & Hauser FMC 380 and FMC 480Z	Davis Controls	AMCL
Level Controller	Kent P96M/20/000	Contro Tech	AMCL
Valve Actuator	R.C.S. MAR-50-30.7	Keystone	AMCL

5.0 DRAWINGS LIST

DRAWING No.	TITLE	COMMENTS
100-10-01	General Overall Flowsheet	Supplied by Canmet Modified by AMCL
PC35-001	Classifying Cyclone Underflow Collection Box	Platework Sketch
PC35-002	Launders for Magnetic Separator	Platework Sketch
PC35-003	Crusher Layout	Layout Drawing
PC35-004	Fabrication Details	Platework Drawing
PC35-005	CWF Mixing/Storage System Layout	Layout and Platework Drawing
PC35-006	Mixing/Storage Flow Diagram	
PC35-007	Dewatering/Thickening Cyclone Feed & U/F Collection Pot	Platework Sketch
PC35-008	Filter Discharge Collection Chute	Platework Sketch
PC35-011	G.A. El 100 000	As Built
PC35-012	G.A. EL 103 600 & 104 600	As Built
PC35-013	G.A. El 107 500	As Built
PC35-014	G.A. Section A-A	As Built
PC35-015	G.A. Section B-B & C-C	As Built
PC35-016	Piping Arrangement El 100 000	As Built
PC35-017	Piping Arrangement El 103 600 & 104 600	As Built
PC35-018	Piping Arrangement EL 107 500	As Built
PC35-019	Piping Arrangement Section A-A	As Built
PC35-020	Piping Arrangement Section B-B & C-C	As Built
PC35-E001	Level Control Wiring Diagram	
PC35-E002	Level Control System SLD	

STATEMENT OF WORK

REQUIREMENT

On behalf of the Department of Energy, Mines and Resources to review the available design and install equipment and commission Phase I and parts of Phase II of the deep cleaning section for the 10 tph pilot plant located at the Coal Research Laboratories, Devon, Alberta.

BACKGROUND

A 2 tph deep cleaning section has been designed to produce feed for the preparation of coal water mixtures or pelletized coal. The new section will be integrated with and accept the product of the existing pilot plant, i.e., coarse cleaned coal (10 mm X 0). This material will be upgrated by grinding and deep cleaning. The deep cleaning section will be built in three stages as outlined in the design report, Contract Serial Number 0SQ85-00188 (Section 10-1). The work statement herein shall be directed to complete implementation defined as Phase I in the report along with parts of Phase II as specified later on. Considerable flexibility is required as noted in Section 10 of the above report where scheduling of various activities will have to be closely co-ordinated to allow maximum benefit for CANMET.

STATEMENT OF WORK

1. Check all required equipment specifications, finalize and certify mechanical engineering drawings against the drawings provided (design information will be provided to potential contractors prior to the bidding stage).

2. Certified drawings of pumps/pump boxes are required to be checked against steelwork drawings for clearance and hold-down bolt positions etc.

3. Install classifying, dewatering and thickening cyclones, drum magnetic separator, and all associated electrical equipment, pumps, pipework, splitters, hoppers, kick plates and sampling points with necessary butterfly valves.

4. Acquire and install 3 level indicators with alarms (low and high) and one level indicator with controller plus electro-mechanical actuator valve combination.

5. Prepare detailed design, fabricate and install splitter boxes hoppers reagent storage vessels, and sampling points as required.

6. Install a rap-sieve bend as an option to using classifying cyclones with necessary piping and valves (not shown in available drawings).

7. Acquire and install two metering pumps for additives and agitator for the conditioner tank (pumps specifications to meet requirements to suit type of additives used, delivery rate, control and pressure output needed).

8. The contractor will be responsible for all mechanical, electrical and piping work necessary for the operation of the coal-water mixture preparation. Also, the contractor is required to commission the installed facility.

9. The contractor has to take in account and discuss with the scientific authority the following factors:
   a) Access and safety.
   b) Minimize interruption of existing facilities.
   c) Provision for access for manual sampling.
   d) Provision for future automation.

10. Provide detailed construction drawings or sketches where required which will be based on drawings produced in the previously mentioned contract report. The coal-water mixture preparation section must be compatible with the existing 10tph plant at Devon. The contractor will prepare all necessary mechanical engineering drawings for construction and final drawings showing the exact location of equipment, piping and services (as built drawings on completion of construction).

11. All motors will have a local start up/shut down switches also emergency stop buttons similar to existing ones in the pilot plant.

12. The following items from Phase II in the report are not included as part of the contract:
   a) Primary and secondary flotation cells.
   b) Dewatering screen.
   c) Oil agglomeration equipment.
   d) Pelletizing disc and ancillaries.

13. The following items are included in the contract:
   a) Ball mill reagent feed vessel.
   b) Modification of the ball mill discharge chute to Sala pump.
   c) Modify and supplement equipment support bases and base frames where required.
   d) Provide base plates (pads) for pumps where necessary.
   e) If necessary modify Ball mill pad to provide the necessary base for the Sala pump at the discharge of the mill.
   f) Fabricate feed headers and underflow hoppers for clustered cyclones and sieve bend as required.
   g) All new construction metal to be prime painted.

14. Prior to start of work the contractor shall review the design drawings and work schedule for clarity with the Scientific Authority to address ambiguities, discrepancies, errors or omissions in the drawings and specifications. The clarifications and correction shall be fianalized in writing.

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15. The contractor shall fully inform himself of the exiting site conditions, by-laws codes, regulations and requirements pertaining to the site and scope of work.

16. The contractor shall supply all labour, material and equipment, temporary facilities, tools, supplies and services required to carry out the work.

CLARIFICATION PROVIDED ON WORK STATEMENT AT BIDDERS' CONFERENCE

Q. Is pump 04 included?

A. Yes, along with piping and valves. However, pump discharge will go to the filter only.

Q. What about the filter?

A. CRL will install the filter. The contractor will be responsible for all connections to and from the filter, along with the necessary electrical wiring.

Q. Where will the controller be located?

A. With pump 02.

Q. Is the crusher by-pass part of the contract?

A. Yes

Q. When will the contractor receive certified drawings of purchased equipment?

A. Expected to be at start-up of work.

Q. Where will the piping terminate after the dewatering cyclones?

A. After the splitter boxes.

Q. What is included in commissioning?

A. Running the plant with water. This means having a dry run first for each piece of equipment. Then run the system with water and balance it.

Q. Are pipes made of steel?

A. No, only PVC pipes with victaulic couplings. Pipes specification schedule 80 polyethylene piping (e.g. Scepter PVC 1120). Butterfly valves (victaulic) may be used in place of gate valves.